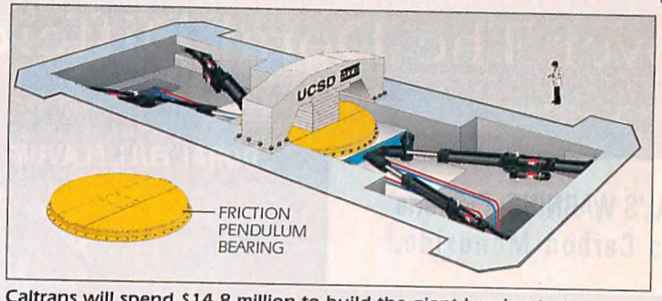
Types of Bridges

Arched
Suspension
Cantilevered
Pier & Girder
Bascule
Lift Bridge
Truss
Steel Arch
Floating Bridge

Giant Bridge-Bearing Tester

LA JOLLA, CA—Rather than strengthen hundreds of thousands of individual components on the Oakland Bay, San Diego-Coronado and Benicia-Martinez bridges, the California Department of Transportation (Caltrans) is banking on the use of huge isolation bearings. Placed between the bridge superstructure and supporting columns, they would absorb the shock of an earthquake and hopefully prevent bridges from collapsing. "In a way, we are putting all of our eggs in one basket," says Frieder Seible, chairman of structural engineering at the University of California at San Diego. "We must be sure that the devices will work as designed."



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Caltrans will spend $14.8 million to build the giant bearing tester.

To test the giant bearings, the engineering school has begun construction of the world's largest bearing tester. The system will be capable of placing a 12-million-pound load on bearings up to 12 ft. in diameter. It will begin testing the bearings in the summer of 1998.

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Bridge Parlence

caisson

{kay'-sahn}

A caisson is a boxlike or cylindrical shell used in constructing a foundation, either underwater, below the groundwater level, or in unstable soils. It permits excavation to proceed inside while protecting the workers against water pressure and soil collapse. Caissons may be open, floating, or pneumatic.

Open caissons, used on dry ground or in shallow water, are open at both bottom and top and are fitted with a cutting edge that facilitates sinking of the structure while large pipes or dredging wells excavate the inside. As the caisson sinks, sections are added on above. When excavation is complete, the interior is filled with concrete. Used for bridge abutments and other deep foundations, open caissons are usually made of reinforced concrete.

Floating, or box, caissons, open at the top and closed at the bottom, are built on shore and floated to the site, where they are sunk in place onto a previously prepared foundation. Built of reinforced concrete, steel, or wood, they serve as shells for piers, seawalls, or breakwaters and for bridge foundations underwater.

Pneumatic caissons are similar to open caissons, but they have a sealed-off working chamber at the bottom, filled with compressed air to keep soil and water from entering. Workers and materials enter the working chamber through air locks. Used to excavate deep foundations under pressure of water and mud, pneumatic caissons are made of reinforced concrete, sometimes faced with steel plates.

Open caissons were used by the Chinese as early as 1500 BC to sink shallow walls in unstable soil. The floating caisson was developed in 1738 during the building of London's Westminster Bridge. The pneumatic caisson was made possible by the invention (1830) of the air lock by the British admiral Thomas Cochrane. It was pioneered (1850s) in England by John Wright and Isambard Kingdom Brunel (see BRUNEL family) and used at great depths by James Eads in building (1867-74) the St. Louis Bridge.

Special caissons have been developed to meet special problems, for example, the huge multidome caisson, 30 by 44 m (98 by 144 ft), used in constructing (1933-36) the central anchorage of the San Francisco-Oakland Bay Bridge. A honeycomb of 55 watertight cylinders, through which clamshell buckets were operated, the caisson was sunk to 85 m (279 ft).

Joseph Gies

Bibliography: Condit, Carl W., American Building (1969); Gies, Joseph, Bridges and Men (1963); Kerisel, J., Down to Earth: Foundations Past and Present (1987); Wittforth, H. Building Bridges (1984).

See also: BRIDGE (engineering); FOUNDATION, BUILDING; LIGHTHOUSE.